U. S. DEPARTMENT OF AGRICULTURE.

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STRAWBERRIES.

BY

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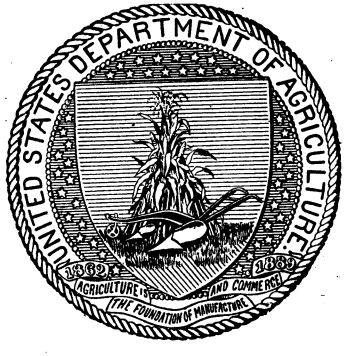

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., May 6, 1904.

SIR: I have the honor to transmit herewith a paper on strawberries prepared by Prof. L. C. Corbett, Horticulturist of this Bureau, and recommend that it be published as a Farmers' Bulletin.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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STRAWBERRIES.

INTRODUCTION.

The story of the origin and evolution of the garden strawberry forms a chapter in the history of economic plants which is of more than ordinary interest to American horticulturists. Although this fruit has been in cultivation nearly two hundred and fifty years, its origin and history were obscure until within the last decade. Botanists passed the garden strawberry and left it without a name. Horticulturists contented themselves with giving the plant its generic name, Fragaria. During the early nineties Bailey interested himself in the history and development of many of the garden plants, among which he included the strawberry, and as a result of his studies the cultivated strawberry has been assigned to a well-recognized botanical species, *Fragaria chiloensis*.

FIG. 1.—Type of *Fragaria virginiana*.

This plant reached Europe about the year 1712, but attracted little attention and made little progress until about 1750 or 1760, when another berry, having a pleasant, pineapple-like aroma, found its way into Europe under the name of Pine or Pine Strawberry. This strain produced cultural varieties rapidly and soon gained a wide distribution, gradually replacing sorts previously in cultivation which had come from the scarlet class of North America, the parents of which were *Fragaria virginiana* and the ever-bearing type, *Fragaria vesca*, which is native to Europe.

During early Colonial days the wild strawberries of the field, *F. virginiana* (fig. 1) and *F. americana* (fig. 2), were abundant and furnished a much prized article of diet. The plants were transplanted to the garden and gave fruits of increased size, but only a few

commercial varieties resulted. Hovey, who may be considered the father of the American strawberry industry, used these native plants along with imported plants of the Pine type as the foundation of a number of crosses, which resulted in the production of two varieties, the Hovey and the Boston Pine. Owing to the loss of records the true parentage of these could never be determined. It was Mr. Hovey's opinion that the Hovey sprang from a cross of Mulberry and Keen's Seedling, both of the Pine type. The Hovey did for the strawberry what the Cape Grape did for viticulture. It formed the main nucleus for the development of commercial sorts, although the scarlet type was long held in high esteem.

FIG. 2.—Type of *Fragaria americana.*

The garden strawberries of this country have come chiefly from the so-called Pine type of berries, which has been proved beyond question to have sprung from *Fragaria chiloensis* (fig. 3), a plant originally brought to Europe from Chile, but which is now known to be native to the western mountain regions of both North and South America. The first native strawberries to be brought under cultivation, however, were those of eastern North America, which belong to the scarlet class, the species being known to botanists as *Fragaria virginiana.* This class, as has been stated, has contributed only sparingly to our present variety list. The wild berry of Europe, which has always been held in more or less esteem because of its ever-bearing tendencies, has likewise contributed only meagerly to the garden sorts of its native countries and none whatever to the American list. The burden of the industry rests upon the Chilean plant.

FIG. 3.—Type of *Fragaria chiloensis.*

The garden strawberry is an American product. It adapts itself to a wider range of latitude and to greater extremes in environment than any other cultivated fruit. It is universally liked and is cosmopolitan in its adaptations.

PROPAGATION.

THE DEVELOPMENT OF NEW SORTS.

The factor of uncertainty and chance which goes with the propagation of plants for the purpose of securing new varieties makes this one of the most fascinating branches of horticultural work. During recent years this line of endeavor has become of such great moment that some men have given their whole time and attention to it. The increased importance attached to this work is not so much the result of a demand for new sorts, as for sorts carrying certain advantageous attributes. The knowledge that certain colors, flavors, and types of fruit are in greater demand than others has created a sentiment in favor of breeding varieties possessing such peculiarities. A more important consideration even than this is the fact that certain strains and varieties of plants are found to resist diseases better than others, to be better fitted to withstand adverse climatic and soil conditions, and to be richer in certain elements—such as sugar, acid, or oil—which may

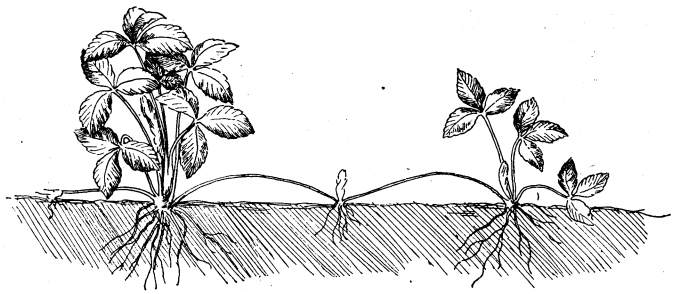

FIG. 4.—Reproduction by means of stolons or runners.

give an advantage over other sorts. The work of determining qualities which are of special advantage and of securing varieties which possess these characteristics in a marked degree has come to be the task of the variety maker.

In the strawberry a very attractive subject for such efforts is presented. It is a plant which is readily propagated by seeds, which is, of course, the only means of securing new forms. The seeds may be selected from plants showing the desired tendencies, or they may be produced by crossing two plants possessing characteristics which it would be desirable to combine in one plant. In any event the seed is the medium through which variation in any direction is expected. But fortunately for the breeder the strawberry is provided with a means of self-preservation through the agency of runners (stolons), as shown in figure 4, which enables the propagator to perpetuate any plant he may develop without fear of loss or change of characters. This feature of the plant, which provides for direct vegetative reproduction, renders

it unnecessary to attempt to fix the type in any strain or creation, as is the case with plants propagated exclusively by seeds. New varieties then are secured through seed propagation, while the desirable horticultural sorts thus secured are propagated by runners.

COMMERCIAL PERPETUATION OF DESIRABLE KINDS.

The commercial propagation of the strawberry naturally proceeds along two lines: (1) The production of standard and novel sorts in large numbers to be sold to local or distant purchasers; and (2) the production of a few standard kinds for the perpetuation of an industry in which fruit production is the chief end. In the first instance fruit production is only a side issue. The main crop is the plants. The

FIG. 5.—A bunch of plants ready for shipment.

aim is to get these as large and strong as possible, and to this end the ground is made rich and put in good tilth by frequent cultivation early in the season. Figure 5 shows a bunch of well-grown plants ready for shipment.

The home production of runners for one's own planting is quite another matter; the fruit crop is the chief object and the production of runners prior to harvesting the fruit is discouraged. The difficulty with this method is to secure strong, well-developed plants for August and September planting. When the main planting is done in the spring the earliness of the plants is of less importance. In favorable seasons, however, strong plants for August and September planting

can be secured even in the New England States. The question of the desirability of purchasing or of growing one's own plants must be decided by the planter. There is this to be said in favor of home-grown plants as compared with plants shipped from a distance, that even in favorable seasons a better stand of plants is always secured from the use of home-grown stock when lifted and immediately reset, while in trying seasons the difference is very considerable, even amounting to as much as success or failure in the stand. Then, too, home-grown plants can be lifted with a ball of earth by means of a transplanting device and reset without a shock during extremely adverse weather conditions. Small home-grown plants are in most cases more to be relied upon than large plants shipped from a distance. In regions along the South Atlantic coast where the fruit matures early the immediate removal of the mulch and preparation of the soil for the roots of the new plants will afford time to secure plants for fall setting, and by special attention to the matter it is possible to have the new plants ready for use in June.

FIELD CULTURE.

Field practices in the cultivation of strawberries vary in different sections of the country to conform to climatic and soil conditions. The factor most influenced by conditions of soil and climate is the time of setting. In some sections the rainfall will permit of either spring or autumn planting, while in other equally good strawberry-producing regions, plants can only be successfully set during the fall. The demands of the market also influence the date of field planting.

SELECTION OF SOIL.

The soil considered best suited to the cultivation of the strawberry in the northeastern part of the United States is what is known as a sandy or gravelly loam. A warm, quick soil, although naturally poor, is to be preferred to a heavy, retentive soil well supplied with plant food. The lacking plant food can easily be supplied by the addition of fertilizers, while the physical characteristics of the soil can only be modified with great difficulty by cultivation, drainage, and the addition of organic matter. Congenial soil and exposure are, therefore, important considerations. The plants not only thrive better on light soils, but the crop is more abundant and the berries are larger and sweeter. The period of maturity can also be modified within reasonable limits by selecting soils which force or retard ripening, by securing southern or eastern exposures which give the plants the advantage of the first warm days of spring, or by placing them on northern and western slopes where, by the use of heavy mulches, the time of ripening may be delayed as much as ten days; and by the use of late-ripening sorts

this time can be extended even longer. This is of more importance at the North than are extra early maturing sorts, because it puts the crop more completely out of competition with the southern product.

PREPARATION OF THE SOIL.

The land to be devoted to the growing of strawberries should, if possible, be planted in a cultivated crop, such as potatoes, beans, or corn, at least one year previous to setting the plants, in order that the larvæ of such insects as wireworms, white grubs, cutworms, etc., may be as completely eliminated as possible. Sod land is a favorite breeding ground for such insects, and should therefore be avoided unless it be new clover sod, which can be turned under with good results.

FIG. 6.—A well-rooted plant with small crown.

Previous to setting the plants the soil should be deeply plowed in order that all organic matter of whatever nature on the surface may be completely turned under. Immediately following the plow the land should be thoroughly pulverized by the use of the harrow, and the surface should be reduced to a condition which would form an ideal seed bed.

FERTILIZERS.

If the soil is not rich, for best results it should have a dressing of at least 20 cartloads of well-decomposed stable manure per acre, either plowed under or incorporated with the soil by surface culture after plowing. If stable manure is not available, plant food should be supplied by a liberal use of fine ground bone and chemical manures rich in nitrogen and potash. The use upon the plants at blooming time of highly nitrogenous manures, such as nitrate of soda, at the rate of about 100 pounds per acre often proves of great value. If it can be applied in solution it will give quicker results than if put on in the form of a salt. If the fertility of the soil is little more than sufficient to support the plant, when the heavy strain of fruit production comes on, the plant will only perfect the number of fruits its food supply will allow; hence the advantage of applying quickly available plant foods just at this critical time.

SELECTING AND PREPARING THE PLANTS.

Plants with small crowns, i. e., a moderate growth of leaves, and with an abundant development of fibrous roots (fig. 6), are the most desirable. If the leaf area seems to be too great for the root system of the plant, the removal of two or three of the older leaves will prove an advantage, as this will reduce the surface of evaporation (transpiration) and will lessen the demand upon the roots, which, because of having been disturbed, are not in a position to perform their normal functions in full measure. During a drought this is more important than during periods of frequent showers. If the crown and the roots of the plant are in good condition, the success of the plantation is assured provided the ground has been well prepared and the work of planting is done with care.

PERFECT AND IMPERFECT FLOWERED PLANTS.

Horticultural varieties of strawberries occur with imperfect (or pistillate) flowers as well as with perfect flowers (those containing both stamens and pistils). It is important that the planter give careful attention to this point in making his plantation, as a patch made up of pistillate sorts alone will be unproductive, while many such sorts when properly interspersed with perfect-flowered varieties have proved to be our largest fruited sorts and most prolific bearers. There is no way of distinguishing the perfect from the imperfect plants when not in bloom. The purchaser must rely for such information upon the description of the variety and the honesty of the grower; but as soon as the blossoms appear the absence of the prominent border of yellow pollen-bearing stamens about the pistil is evidence of the imperfect or pistillate form. While many sorts belonging to this class bear profusely and are large-fruited, the fruits will be abortive unless perfect-flowered sorts are interspersed among them in the plantation. A common practice is to set every fourth or fifth row with a perfect-flowered sort which blooms at the same period as the pistillate variety of which the plantation is chiefly composed. Figure 7, showing perfect and imperfect flowers, will serve to aid the observer in distinguishing these forms.

FIG. 7.—Flowers: 1 and 2 perfect; 3, pistillate flower.

POLLINATION.

The transfer of the pollen from the anther to the pistil is called pollination. This is an exceedingly important operation in nature, for upon it hinges the success or failure of the crop. It is even more

important in plantations where pistillate varieties predominate than where perfect-flowered sorts are chiefly used. In the first case there must be a transfer of pollen from plant to plant, while in the second it is merely from flower to flower. Though all are provided with both stamens and pistils, as a rule self-fertilization is guarded against by the pollen and pistil of the same flower maturing at different times.

The agencies in nature which assist in pollination are chiefly two, insects and the wind. Good weather and an abundance of bees are desirable during the blooming season to insure a good set of fruit. Heavy rains at blooming time destroy the pollen, injure the stigmas, and interfere with complete fertilization with the result that "nubbins" are more abundant during such seasons than when the weather conditions are more favorable. A frost during the blooming period may be just sufficient to injure the blossoms open on that day without injury to those not yet expanded. The result is a large number of deformed lopsided fruits and nubbins. The blossoms which expand after the frost will produce perfect fruits under suitable weather conditions.

As the distance over which pollen is carried by the wind is not great, practice has demonstrated that every fourth or fifth row of a plantation should contain a perfect-flowered sort.

WHEN TO SET THE PLANTS.

There are several considerations which govern the time and manner of setting strawberry plants. The time to plant depends in humid regions more upon the rainfall than upon any other factor. If there are not timely rains at the planting season to give the plants an opportunity to establish themselves, the stand will be uneven, with the result that more work will be required to keep the land free from weeds and more trouble will be necessary to get the blank spaces occupied by runners from the plants that survive. The plants that withstand the drought are checked and dwarfed. They seldom recover so as to make either satisfactory croppers or plant producers. It is most satisfactory and most economical, therefore, to choose that season which offers most advantages at planting time, other things being equal. It is impossible to specify the season for each locality or even for large areas, as local conditions of soil and climate necessitate different practices in localities only a short distance apart. In general there are only two seasons for planting—spring and fall—but in some localities spring planting should be done in April or May by the use of the preceding season's plants, while in others it may be done in June from the crop of runners of the same season.

In irrigated regions planting can be done at whatever season the work will give best results in future crop production. In humid regions rainfall is a determining factor. In the northern half of the

prairie region west of the Mississippi spring planting gives best results. In the Middle Atlantic States the work is divided between spring and August planting, with the balance in favor of the latter in some localities. In New England the work is chiefly confined to the spring months, although there are enthusiastic advocates of fall planting, especially among those who combine strawberry growing with the trucking business on expensive lands near the large cities. In the Atlantic Coast States south of New York, August and September planting is most extensively practiced, particularly upon the more retentive soils. In the trucking region on the islands about Charleston, S. C., spring planting is extensively practiced, as it results in a paying crop the following year, while only a small crop can be harvested from fall-set plants. On these quick soils the plant can be grown as an annual, and farther south, in Georgia and Florida, the fall-set plants will return a profitable crop the following spring. On the heavier soils of South Carolina, however, fall planting, with the paying crop one year from the following spring, is the most profitable method. The particular time during the summer or fall when the planting should be done will be governed by the occurrence of the seasonal rains—if in July and August, plant then; if in September and October, plant at that time. If the earlier date can be taken advantage of, so much the better; the plants will have a longer period in which to grow, and they will be stronger and the crop heavier in consequence.

HOW TO SET THE PLANTS.

Success in transplanting strawberry plants depends, first, on the quality of the plant, and, second, upon the time and manner of doing the work. If the plants are good, the stand, other conditions being favorable, depends upon care in setting them. The success of this operation is measured by the degree of compactness of the soil about the roots of the plant. If the plant has many roots and these are thrust into a hole made by an ordinary dibble, it is more difficult to get the earth in contact with the roots than when the plant has fewer roots. The plant with the greatest number of feeding roots is, however, the most desirable if properly handled. Such plants should be set in a broad, flat hole where the roots can be spread out in natural form. By giving the crown of the plant a whirl between the thumb and finger to throw the roots out like the ribs of an umbrella and quickly putting it in place while the roots are still thrown out from the crown, the normal position of the root system can be closely approached.

Another very satisfactory method is to open a hole by thrusting the blade of a bright spade into the soil, move the handle forward, thus opening a broad, wedge-shaped hole, spread the roots of the

plant in fan shape, and place them in the hole; then withdraw the spade and insert it about 6 inches farther forward, and by a backward movement of the handle firmly press the earth against the roots of the plant. Two persons—a man to operate the spade and a boy to place the plants—can set plants very rapidly in this manner. This practice is particularly well suited to localities with sparse rainfall, as it thoroughly compacts the earth about the roots of the plant and allows the roots to extend full length into the moist soil. Plants set in this way have their roots more deeply inserted in the soil than when the roots are spread out in umbrella fashion and as deeply as when set with a dibble. They also have the additional advantage of being

FIG. 8.—Hill system of cultivation.

spread out so as to have a larger percentage of their surface actually in contact with the soil than when set with a round dibble.

DEPTH TO SET THE PLANTS.

No plant which the gardener has to handle is more exacting in regard to depth of planting than the strawberry. As the plant is practically stemless, the base of the leaves and the roots being so close together, care is required to avoid setting the plant so deep that the terminal bud will be covered or so shallow that the upper portion of the roots will be exposed, either being a disadvantage which frequently results in the death of the plant.

SYSTEM OF PLANTING.

There are two general systems of planting strawberries: One contemplates the maintenance of the plants in hills with the possibility of cultivating them in both directions; the other allows more freedom and the plants spread and form a broad belt or row called a "matted row."

Planting in hills.—The system of cultivation predetermines the system of planting. For the hill system of culture (fig. 8) plants are set singly either 3 by 3 feet apart, or with the rows 4 feet apart and the plants 2 feet apart in the row, depending upon the character of the soil and the length of time the plantation is to be maintained. In Florida a common practice is to lay the land off in broad beds 8 to 12

FIG. 9.—Matted row cultivation.

feet wide, the rows of plants to run lengthwise of the beds, the rows 24 inches apart, with the plants 18 inches apart in the rows. Such beds afford sufficient drainage and hold the mulch better than narrow beds or raised rows, and the space between the plants admits light to all sides of the plant—an advantage in coloring the fruits which can not be secured by the matted row system early in the season in the climate of Florida. The hill system raises the plant somewhat and admits of more intensive cultivation than does the matted row, an important consideration in combating crab-grass. On very light dry soils it is considered best to practice flat or level culture rather than bedding.

Planting in matted rows.—In order to maintain a belt of plants 12 to 18 inches wide, as shown in figure 9, and still have space between the

belts for cultivation and the other operations necessary to the successful management of a plantation, the rows at planting time should be much farther apart than is necessary with the hill system. A common practice is to set the plants in single rows 4 feet apart, with the plants 12 inches apart in the row. The runners which develop from these plants are then allowed to take possession of the area for 6 to 9 inches on either side of the original plants, thus making a matted row 12 to 18 inches wide; this leaves 30 inches between the rows, which allows ample space for cultivation and gathering the fruit. This space can be reduced from 30 inches to as little as 18 inches where land is valuable and it is necessary to secure maximum returns; on thin soil, however, the greater distance is most satisfactory. There is one advantage in the narrow cultivated space. After the second crop has been harvested the runners can be allowed to take possession of the cultivated middle, and when the young plants become thoroughly established the original rows can be broken up with a narrow turning plow or a sharp cultivator. In this way a patch can be very satisfactorily and cheaply renewed, and by a liberal use of suitable fertilizers the rotation can be kept up on the same soil for several years. Some planters prefer to set the plants for the matted row in a double row at planting time. The practice is to establish two rows 12 inches apart, 6 inches on each side of the center of the matted belt, setting the plants 2 feet apart in each row and alternating the plants in the row, so that the plants actually stand a little over a foot apart, as shown in the accompanying diagram:

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CULTIVATION.

Clean and shallow culture are the watchwords of successful cultivators. Growers have come to realize that cultivation means more than the destruction of weeds. Ridding the soil of weeds, thus removing the competition between these interlopers and the plants it is desired to foster, is an important part of the work, but not all. Cultivation has a beneficial influence upon the soil by loosening it and making it more easily penetrated by moisture in the form of rain or dew. By keeping a blanket of loose soil 3 inches thick over the area not actually occupied by plants, the evaporation of soil moisture is reduced; more moisture is, therefore, retained for the use of the plants in the rows. By conserving moisture, cultivation tends to counterbalance the evil effect of drought. A better stand of plants can be maintained during a dry period on well-tilled ground than upon ground that is poorly cultivated. The mechanical effect of grinding the soil upon itself during cultivation reduces it to smaller particles, thus exposing more surface to the action of soil moisture, and, as a result,

increasing the available plant food of the soil. The old saying that "tillage is manure," if interpreted in terms of crop yield, is true, though, since tillage adds no plant food to the soil, the statement is not literally true. The benefit from preserving a soil mulch, with its consequent economy in the use of soil moisture, is sufficiently important to justify thorough tillage.

MULCHING.

Covering the surface of the soil with dead or decaying vegetable matter is the meaning of the term mulching as here used.

Objects of mulching.—Mulching in strawberry culture serves different purposes, depending upon the locality in which the plants are grown. A mulch acts as a protection from cold, prevents freezing and thawing and the consequent lifting of the plants ("heaving out"); it retards growth in cold regions by shading the crowns and maintaining a low soil temperature longer than in soil not mulched; it acts as a conserver of moisture, discourages weed growth by smothering the young seedling, and finally protects the fruit from contact with the soil.

Materials for mulch.—The materials which can be used in mulching are various, but their value depends largely upon their freedom from weed seeds and their fitness to protect the plants without smothering them. Whole or cut straw free from grains, strawy manure from the horse stable, and pine straw from the forest are among the more common mulching materials. In certain sections marsh hay, either from fresh or salt water marshes, is a common and very satisfactory mulching material.

When to apply the mulch.—At the North where the soil is likely to freeze and thaw several times in the course of the winter, it is the practice to put on the mulch as soon as the ground is sufficiently frozen to allow driving upon it with a loaded cart or wagon. Where the freezing of the soil is only superficial or only temporary, if at all, the mulch serves the purpose of a protection from wind more than from frost, and in such sections the mulch is put on as soon as active growth ceases, usually early in December, and is allowed to remain until after the crop is harvested.

Some growers remove the mulch early and give the plants thorough cultivation before the fruits are half grown; then if it seems desirable to protect the fruits from the earth the mulch is replaced for this purpose.

In other localities where heavy snows are of annual occurrence, and where they remain throughout the winter, thus affording protection from repeated freezing and thawing, as well as preventing deep freezing of the soil, mulching is not generally practiced; if practiced at all a light mulch only can be used, as a heavy covering is likely to cause loss by smothering the plants.

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HARVESTING AND SHIPPING.

The time of gathering the fruit, as well as the manner of handling, is governed by the use to which it is to be put. If for a local market, much riper fruits can be handled than when they are to be shipped long distances.

The most progressive growers of strawberries for local markets not only give particular attention to the ripeness of the fruit, but to assorting and grading as well, only large perfect berries being placed in the first grade, and all small or soiled fruits in the second.

Shipment to distant markets.—For a distant market the fruits must be gathered as soon as fully grown and colored. When the fruits are removed from the plants they should go either into cooled shipping cases or into a cool storeroom where the temperature can be maintained at about 50° F. If this is impracticable, they should be placed in the shade in as cool a situation as possible. Fruits to be shipped in refrigerator boxes (fig. 11), such as are used by the southern growers (Florida growers in particular), can be placed in the chilled carriers as soon as they have stood in the shade for a half hour. Such hardening off or chilling has much the same effect on soft fruits of this nature as it has upon flowers; it checks the ripening process and, while it does not entirely stop it, the effect is to deliver the fruits at the end of their journey in much better condition than when not so chilled. In this, as in all work of like nature, careful judgment is necessary. Too much cold is as bad as too little; in any case the chilling and icing should be considered merely as a means to an end. Experience has demonstrated that it is not advisable to attempt to hold soft fruits for any length of time in cold storage. The icing or shipping in refrigerator carriers allows the grower to bring his fruits to a higher state of perfection on the vines than when he is obliged to ship long distances without such appliances. For that reason alone this method of handling should be encouraged, as it gives the consumer a higher-grade product. The great expense connected with this system of shipment means high prices to the consumer. Under present conditions it costs from 10 to 13 cents per quart to ship strawberries in refrigerator carriers from central Florida to the New York market. Add to this the commission for selling, and the fruit must sell for at least 25 cents per quart, in order that the grower may get a fair price

FIG. 10.—Fruiting plants in matted row.

for his product. With the existing express rates, 6 to 8 cents f. o. b. cars at shipping point is a better remuneration for the grower than 25 cents wholesale in New York City.

Receptacles.—Whether it is to be shipped in crates or refrigerator carriers or to be carried to the local market, for best results the fruit should not be rehandled after it is picked. The pickers should be trained to do the necessary assorting and grading as they pick the

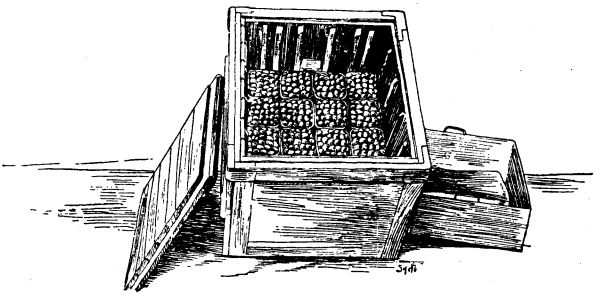

FIG. 11.—Refrigerator shipping case.

fruit in the receptacles in which it is to be marketed. In some localities, where the fruits become greatly soiled from mud splashing over them during heavy rains, growers find it advisable to assort and pack the fruits in the manner shown in figure 12, and also to rinse them in water before assorting and packing them. This is the system used by many of the most extensive and successful Florida growers.

The light splint-wood basket, holding 1 quart (fig. 12), is the most popular and most universally used. Many different forms of box or

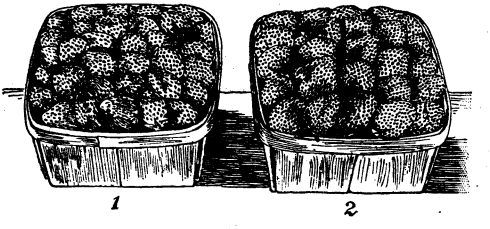

FIG. 12.—Ungraded and selected fruit in splint-wood baskets: 1, Not graded or arranged; 2, selected and arranged.

basket have been designed, and various materials other than wood have been used in their construction, but up to the present none has met with general adoption.

As above stated, the refrigerator carrier is almost universally used for long-distance shipment. For shorter hauls, not more than a night's ride, the ordinary slat crate (fig. 13), holding 24 to 36 quart boxes, is very popular; it is also the package in general use for local marketing.

Picking.—In the commercial production of strawberries considerable numbers of persons have to be employed in picking the fruit and as this work is usually paid for by the quart it becomes necessary to have some system of keeping account of the work done by each individual. Different growers employ different schemes. Some issue a check or card for each quart of berries harvested, and when a certain number have been obtained by the picker these are exchanged for one of larger denomination. This has the advantage of reducing the number of quart checks necessary. The one objection to this plan is the liability to loss on the part of the pickers. Other growers use a tag similar to a shipping tag, which is fastened to the clothing of the picker, and as the fruit is delivered to the inspector credit for as many quarts as have been picked is punched out of the tag. Others use only a system of bookkeeping, the picker delivering his fruit to the inspector and depending upon the accuracy of the tallyman for the count. The system of recording the work of each picker will largely depend upon the character of the help employed and the extent of the work to be done. The plan that suits the circumstances of one may not be that which will meet the requirements of another. Each grower must study this problem for himself, and decide upon the plan best adapted to his conditions.

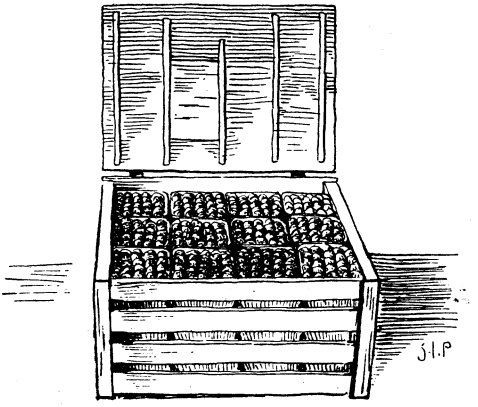

FIG. 13.—A slat shipping crate.

A convenience which is almost a necessity is a picking stand carrying from 4 to 6 boxes. A good type is shown in figure 14. The short legs hold the tray off the ground and prevent injury to the fruit, while the number of baskets (4 or 6) allows the picker to grade the berries as gathered.

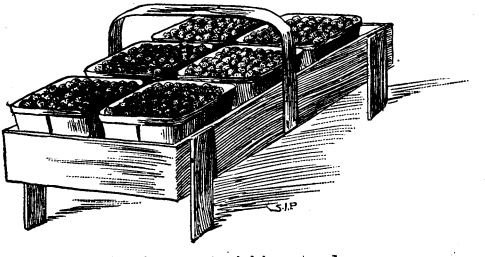

Fig. 14.—A picking stand.

FORCING FOR WINTER FRUIT.

Because of the supply of southern-grown berries which reach the markets from February on, the forcing of strawberries has little to encourage it, except for special purposes, such as to supply the tables of those who can disregard the cost of the product and those who wish to use the plants for decorative purposes. There are, however, some people who will wish to grow a few pots of strawberries out of season, and for their information a brief description of the methods used is here given.

Plants to use.—The plants for forcing purposes should be the earliest runners from well-established plants. These runners should be rooted in 2 or 3 inch pots, plunged in the soil at a convenient distance from the parent plant to allow the runner to be placed over the pot and held in position by a small weight (stone) placed upon the extension of the runner to hold it and to discourage its growth beyond the pot. As soon as the young plant has filled the small pot with roots, it should be cut loose from its parent and immediately shifted to a 6-inch pot filled with soil composed of three parts of well rotted turf and one part of sharp sand. To this should be added about one quart of finely ground bone or dissolved rock for each two bushels of the compost. As soon as the plants have been placed in the 6-inch pots, these should be plunged in coal ashes or tan bark, either in a cold frame or in a position where they can be sheltered from driving rains. The cold frame is the most convenient and satisfactory arrangement. The plants from this time on should be kept in a growing condition. About the middle of September or the first of October the pots will be found filled with roots and the drying-off process should then begin. This will cause the plants to store up food in the crowns for the work which they will be called upon to do. The plants should be kept rather dry, and be allowed to remain in the cold frame until freezing weather begins, or until about eight weeks before the berries are desired.

The forcing period.—Upon taking the plants from the cold frame, all dead or diseased leaves should be removed, the pots generally cleaned, and the crowns of the plants sprayed with Bordeaux mixture. They should then be placed in a house with a night temperature of about 35° and a few degrees warmer during the day, and the same arrangements in regard to plunging the pots as were maintained in the cold frame should be observed in the forcing house. After about six or eight days, the temperature of the house should be raised at least 10 degrees at night with a corresponding rise during the day. These higher temperatures should be maintained throughout the whole forcing period.

Pollination.—As soon as the blossoms appear, it will be necessary to hand-pollinate them, in order to cause the fruits to set, and to

accomplish this it is necessary to have the house dry and comparatively warm during the middle of the day, which is usually the most convenient and satisfactory time for pollinating. A camel's-hair brush can be used to transfer the pollen from stamen to pistil and from plant to plant.

Fertilizing.—As soon as the fruits begin to swell the plants should be fed with a dilute liquid manure made preferably from well-rotted cow manure or sheep manure. The first application should be quite dilute and should be applied soon after the berries set. This application should be followed in about one week's time by a second application of somewhat stronger manure water, a third about three days later, and so on at the same interval until the berries begin to color, when all stimulant should be withheld and pure water only used for wetting the plants.

Thinning and protecting the fruits.—After the fruits have set, if there are more than six or eight well formed berries upon a single truss, it will be well to reduce the number to six or eight at most for the strongest plants. As these increase in size, in order to prevent them from becoming distorted and ill shaped, a support must be supplied. Experience has proved that a most convenient arrangement of this kind can be provided by using a small square of fine-mesh window-screen wire, cut so that it will fit the top of the pot somewhat closely and still project sufficiently to support the berries.

Plants grown in this way make very satisfactory objects for decorative purposes and form a very attractive feature in a forcing house, although the yield of berries is not sufficient to make them of any great economic value unless the price obtainable is at least $1 per quart. Varieties with large symmetrically formed fruits and perfect flowers should be selected for this work.

VARIETIES.

The popularity of one sort soon gives place to that of a more promising new rival. This is perhaps more strikingly true of varieties of strawberries than of any other cultivated fruit. Varieties are of local adaptation, however, and a new sort must pass an examination in each locality before its fitness can be determined. In some localities sorts remain in general use for many years, but in most sections they follow one another in quick succession. Exceptions to this rule are some of the strawberry-growing sections of the Pacific coast. These areas seem to require peculiar qualities in the varieties adapted to them and as a result only sorts of local origin find favor there. Some varieties of this character have been able to hold the first place among cultivated sorts of the region for a quarter of a century or more in spite of repeated introductions of new varieties from other sections. This serves to emphasize the statement that varieties are local in their

adaptation. Perhaps no fruit is more cosmopolitan than the strawberry, yet this is only made possible by the great variation in sorts adapting it to all the varied conditions of soil and climate which it has to encounter.

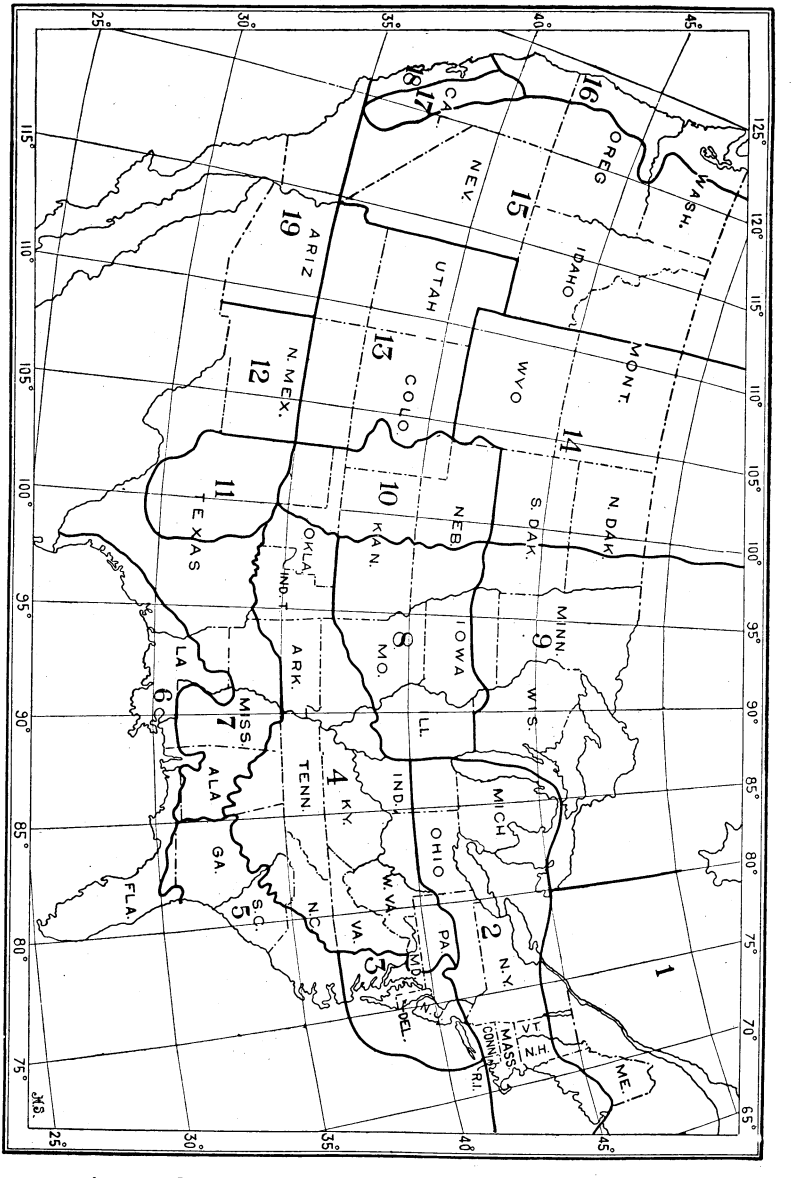

FIG. 15.—Fruit sections of the United States.

The question of the adaptability of varieties has been very carefully worked out by the American Pomological Society. The map (fig. 15) shows the various fruit sections of the United States, which for convenience are designated by numbers. Experience has demonstrated

that certain varieties are well adapted to each of these divisions. A few of the sorts which can be planted in each division with a reasonable assurance of success are enumerated in the following list under each division, as indicated by its number.

The reader should consult the map to determine the division in which he is located and the following list for suitable varieties to plant in his section:

Division 1: Bederwood, Bubach No. 5, Carrie, Clyde, Crescent, Haverland, Saunders, Warfield, Wilson.

Division 2: Brandywine, Bubach No. 5, Clyde, Crescent, Gandy, Greenville, Haverland, Lovett, Michel Early, Parker Earle, Saunders, Sharpless, Warfield, Wilson.

Division 3: Bederwood, William Belt, Bismarck, Brandywine, Bubach No. 5, Enormous, Gandy, Greenville, Haverland, Manchester, Seaford, Tennessee Prolific, Lady Thompson, Warfield.

Division 4: Bederwood, Bubach No. 5, Crescent, Gandy, Greenville, Haverland, Michel Early, Lady Thompson, Warfield, Wilson.

Division 5: Brandywine, Gandy, Hoffman, Michel Early, Lady Thompson.

Division 6: Hoffman, Michel Early, Miner, Neunan, Lady Thompson.

Division 7: Brandywine, Bubach No. 5, Captain Jack, Cloud, Crescent, Downing, Gandy, Glen Mary, Michel Early, Miner, Neunan, Lady Thompson.

Division 8: Bederwood, Bubach No. 5, Crescent, Cumberland, Downing, Gandy, Haverland, Michel Early, Miner, Parker Earle, Sharpless, Warfield, Wilson.

Division 9: Bederwood, Crescent, Parker Earle, Warfield, Woolverton.

Division 10: Champion, Crescent, Downing, Gandy, Haverland, Monarch, Parker Earle, Warfield, Wilson.

Division 11: Hoffman and Michel Early are the only sorts mentioned as having proved themselves adapted to this region in the list prepared by the American Pomological Society.

Division 12: Arizona Everbearing, Australian Crimson, Dollar, Sharpless, and Lady Thompson where irrigation can be provided.

Division 13: Bederwood, Crescent, Cumberland, Haverland, Jessie, Manchester, Monarch, Sharpless, Woolverton.

Division 14: Crescent, Wilson, Bubach No. 5, Downing, Enhance, Gandy, Haverland, Jessie.

Division 15: Hood River, Jessie, Parker Earle, Sharpless, Saunders, Downing, Crawford.

Division 16: Hood River, Magoon, Sharpless, Wilson.

Division 17: Sharpless.

Division 18: Dollar, Jessie, Monarch, Sharpless. These sorts are only fairly well adapted to the region.

Division 19: Arizona Everbearing, Monarch, Australian Crimson, Dollar, Sharpless, Lady Thompson.

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